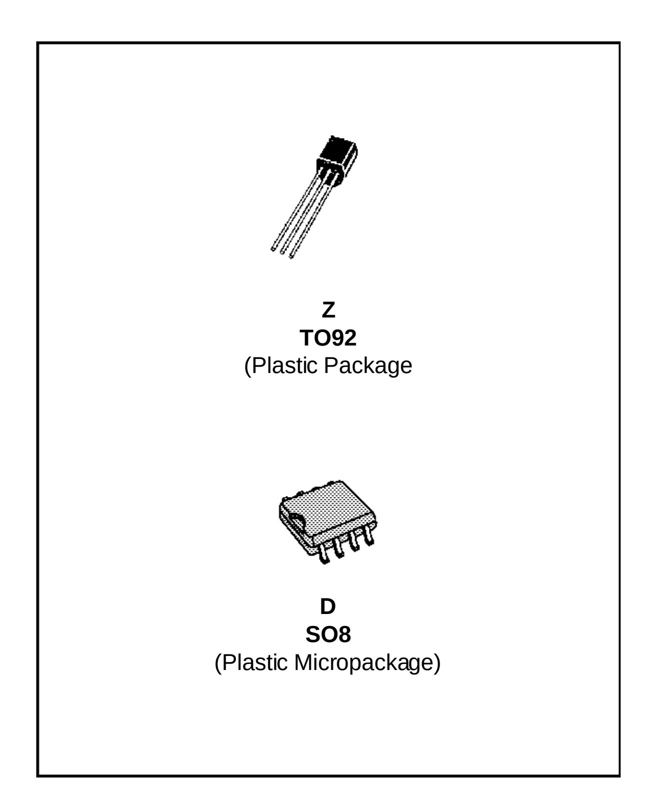


LM236,A
LM336,B

2.5V VOLTAGE REFERENCES

- LOW TEMPERATURE COEFFICIENT
- WIDE OPERATING CURRENT OF 400µA TO 10mA
- 0.2Ω DYNAMIC IMPEDANCE
- GUARANTEED TEMPERATURE STABILITY
- FAST TURN-ON



DESCRIPTION

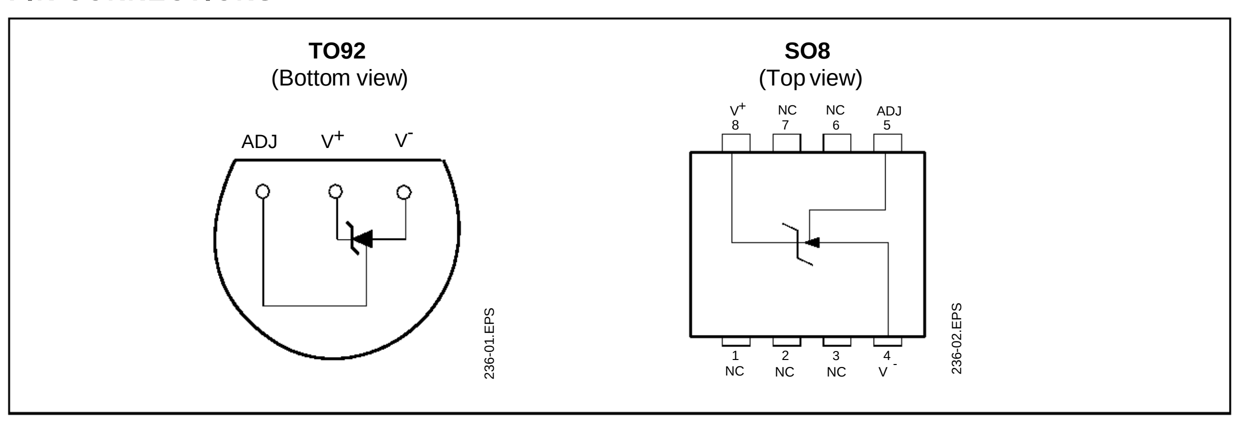
The LM236 and LM336 are precision 2.5V regulator diodes. These voltage reference monolithic ICs operate like 2.5V zener diodes with a low temperature coefficient and a dynamic impedance of 0.2Ω. A third pin enables adjusting the reference voltage and the temperature coefficient.

ORDER CODES

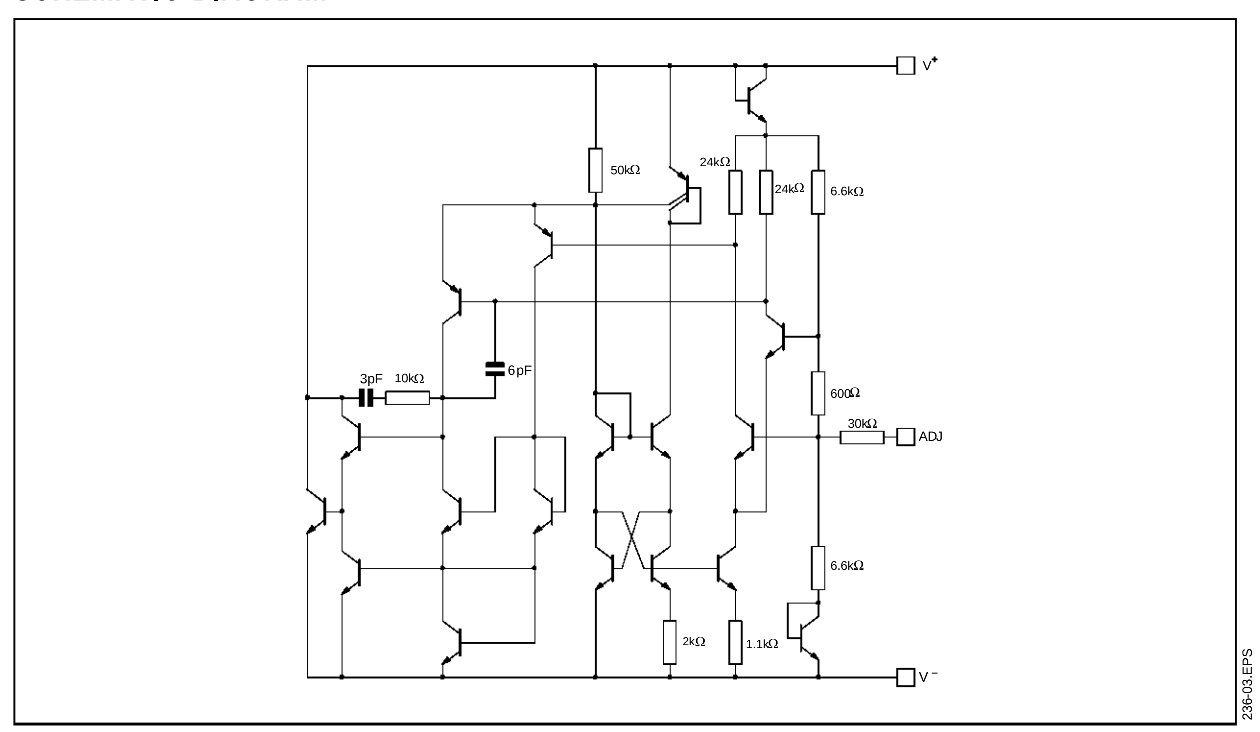
Part number	Temperature Range	Package	
		Z	D
LM236,A	–25°C, +85°C	•	•
LM336,B	0°C, +70°C	•	•

236-01.TBL

PIN CONNECTIONS



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	LM236,A	LM336,B	Unit
 I_R I_F	Current Reverse Forward	 15 10	 15 10	mA
T_{oper}	Operating Free-air Temperature Range	–25 to +85	0 to +70	^oC
T_{stg}	Storage Temperature Range	–65 to +150		^oC

236-02.TBL

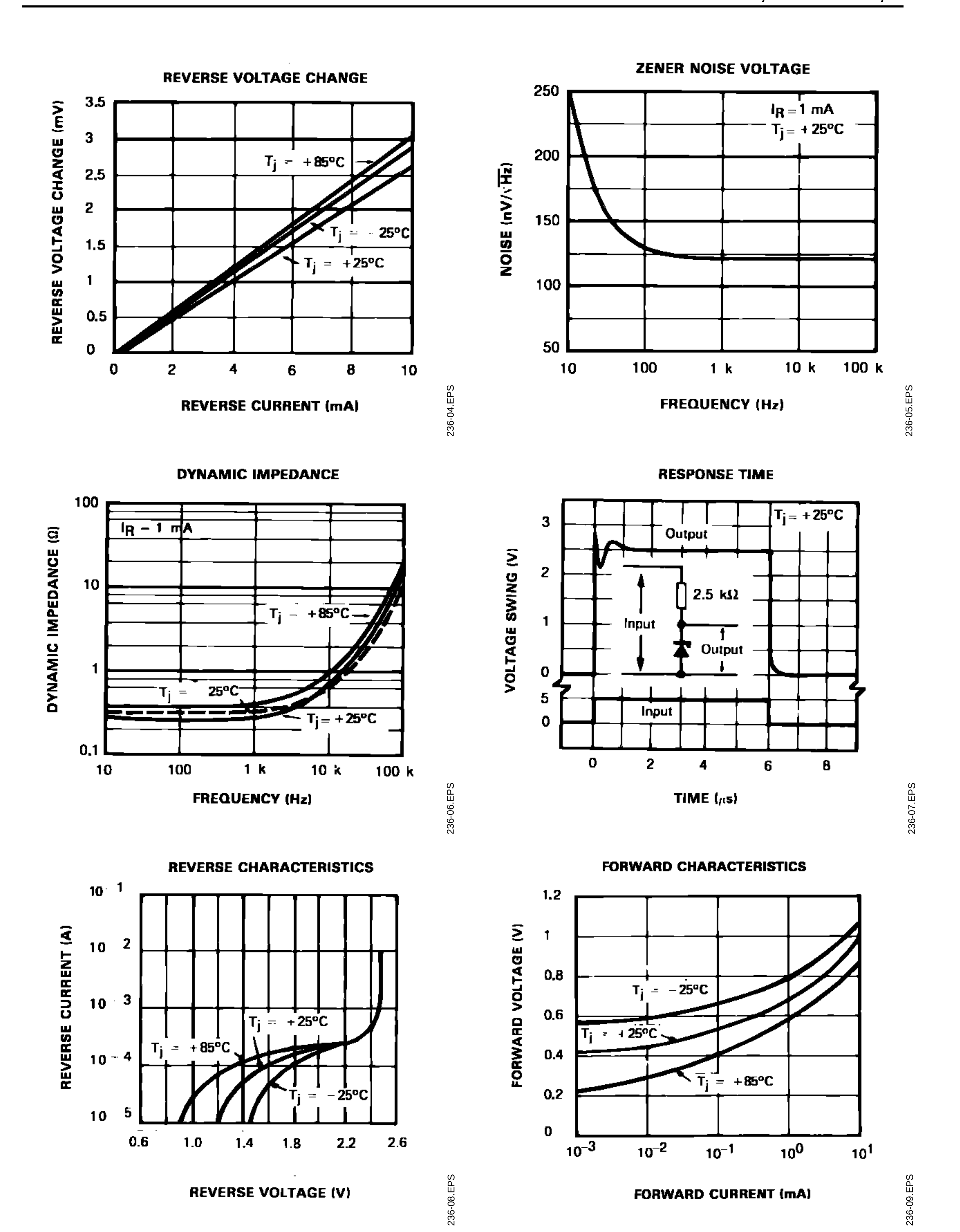
ELECTRICAL CHARACTERISTICS

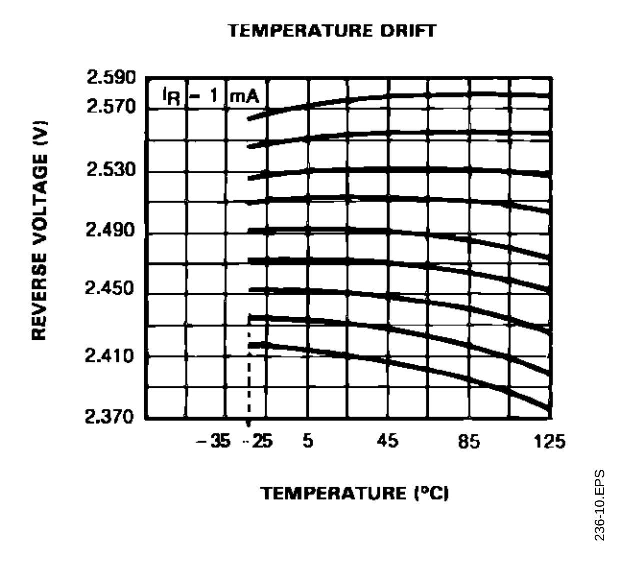
LM236,A $-25^oC \leq T_{amb} \leq +85^oC$
LM336,B $0^oC \leq T_{amb} \leq +70^oC$
(unless otherwise specified)

Symbol	Parameter	LM236,A			LM336,B			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_R	Reverse Breakdown Voltage (T_{amb} = +25^{o}C, I_R = 1mA) LM236, LM336 LM236A, LM336B	 2.44 2.465	 2.49 2.49	 2.54 2.515	 2.39 2.44	 2.49 2.49	 2.59 2.59	V
ΔV_R	Reverse Breakdown Voltage Change with Current (400µA ≤ I_R ≤ 10mA) T_{amb} = +25^{o}C $T_{min.} \leq T_{amb} \leq T_{max.}$		 2.6 3	 6 10		 2.6 3	 10 12	mV
Z_D	Reverse Dynamic Impedance (I_R = 1mA) T_{amb} = +25^{o}C $T_{min.} \leq T_{amb} \leq T_{max.}$		 0.2 0.4	 0.6 1		 0.2 0.4	 1 1.4	Ω
K_{VT}	Temperature Stability (V_R = 2.49V, I_R = 1mA)		3.5	9		1.8	6	mV
K_{VH}	Long Term Stability (T_{amb} = +25^{o}C ±0.1^{o}C, I_R = 1mA)		20			20		ppm

236-03.TBL




REVERSE VOLTAGE CHANGE
REVERSE VOLTAGE CHANGE (mV)
3.5
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
REVERSE CURRENT (mA)
Tj = +85°C
Tj = - 25°C
Tj = +25°C
236-04.EPS
ZENER NOISE VOLTAGE
NOISE (nV/√Hz)
250
200
150
100
50
10
100
1 k
10 k
100 k
FREQUENCY (Hz)
IR = 1 mA
Tj = +25°C
236-05.EPS
DYNAMIC IMPEDANCE
DYNAMIC IMPEDANCE (Ω)
100
10
1
0.1
10
100
1 k
10 k
100 k
FREQUENCY (Hz)
IR = 1 mA
Tj = +85°C
Tj = 25°C
Tj = +25°C
236-06.EPS
RESPONSE TIME
VOLTAGE SWING (V)
3
2
1
0
5
0
0
2
4
6
8
TIME (µs)
Tj = +25°C
Output
2.5 kΩ
Input
Output
Input
236-07.EPS
REVERSE CHARACTERISTICS
REVERSE CURRENT (A)
10-1
10-2
10-3
10-4
10-5
0.6
1.0
1.4
1.8
2.2
2.6
REVERSE VOLTAGE (V)
Tj = +25°C
Tj = +85°C
Tj = -25°C
236-08.EPS
FORWARD CHARACTERISTICS
FORWARD VOLTAGE (V)
1.2
1
0.8
0.6
0.4
0.2
0
10-3
10-2
10-1
100
101
FORWARD CURRENT (mA)
Tj = -25°C
Tj = +25°C
Tj = +85°C
236-09.EPS



APPLICATION HINTS

The LM236, LM336 voltage references are easier to use than zener diodes. Their low impedance and wide current range facilitate biasing in any circuits. Besides, the breakdown voltage or the temperature coefficient can be adjusted so as to optimize the performance of the circuit.

Figure 1 represents a LM336 with a 10kΩ potentiometer to adjust the reverse breakdown voltage can be adjusted without altering the temperature coefficient of the circuit. The adjustment range is generally sufficient to adjust the initial tolerance of the circuit and the inaccuracy of the amplifier circuit.

To obtain a lower temperature coefficient two diodes can be connected in series as indicated in Figure 2. When the circuit is adjusted to 2.49V the temperature coefficient is minimized.

For a correct temperature coefficient, the diodes should be at the same ambient temperature as the LM336. The value of F1 is not critical (2-20kΩ).

Figure 1 : The LM336 with Pot for Adjustment of Breakdown Voltage

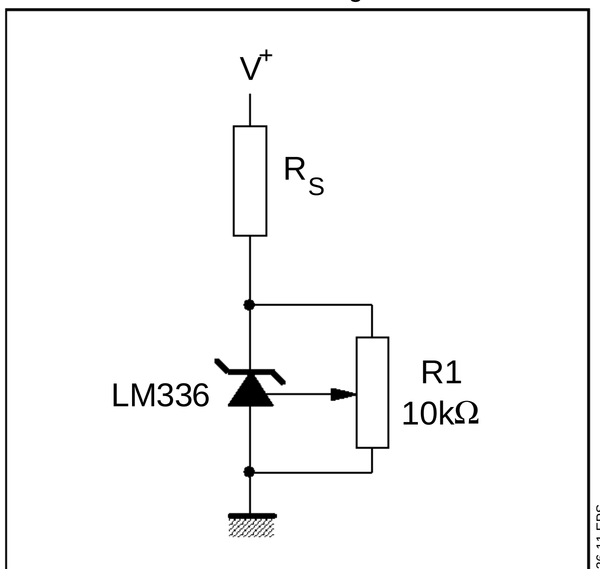
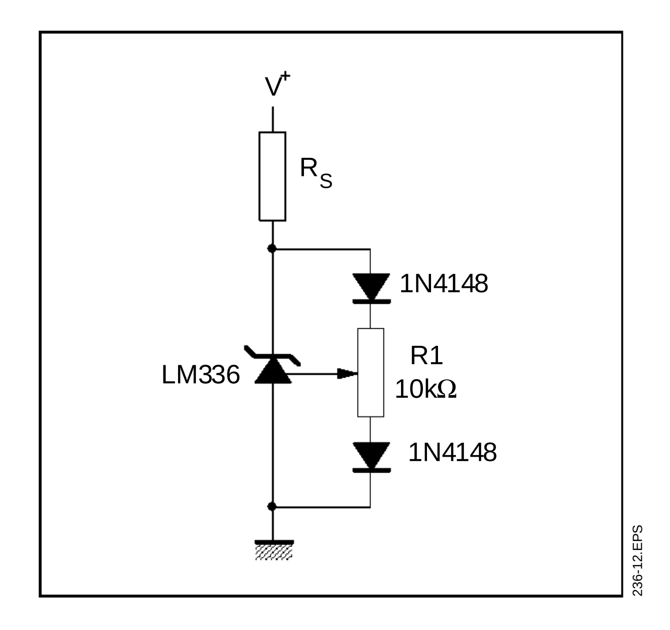


Figure 2 : Temperature Coefficient Adjustment



TYPICAL APPLICATIONS

Figure 3 : 2.5V Reference

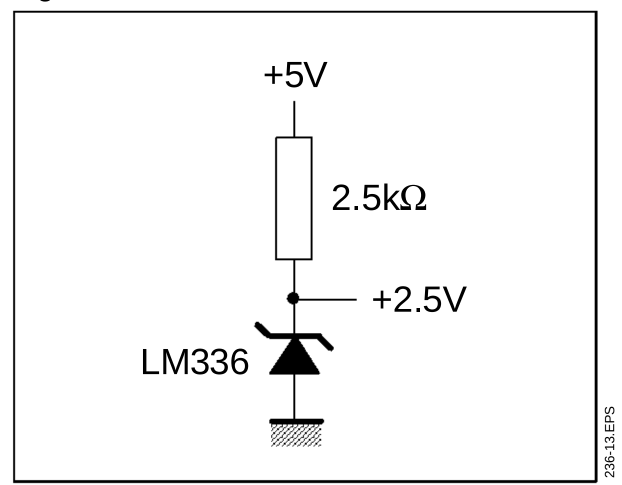


Figure 4 : Wide Input Range Reference

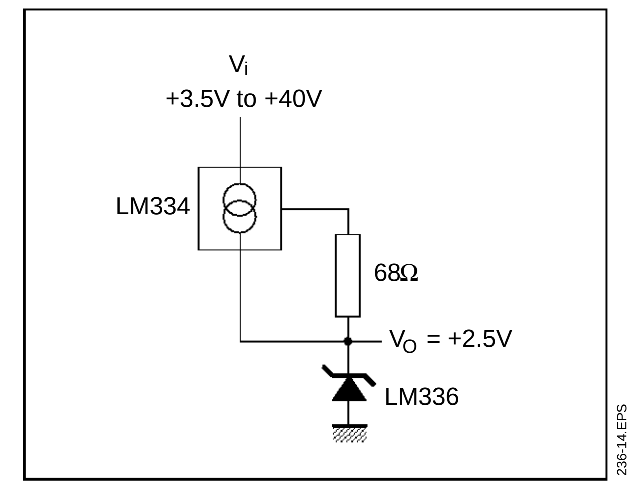


Figure 5 : Precision Power Regulator with Low Temperature Coefficient

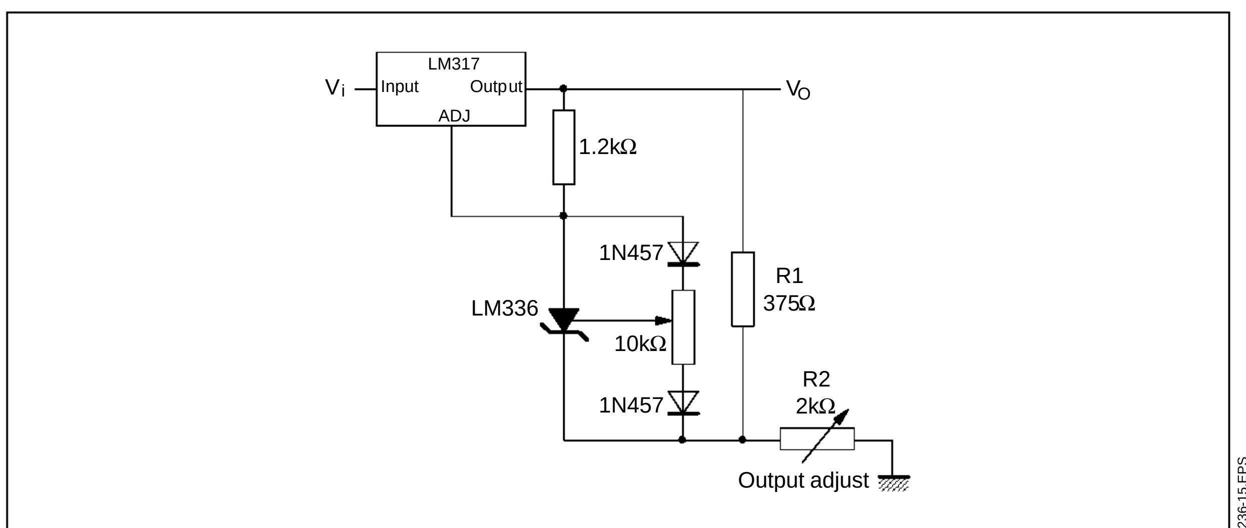


Figure 6 : Adjustable Shunt Regulator

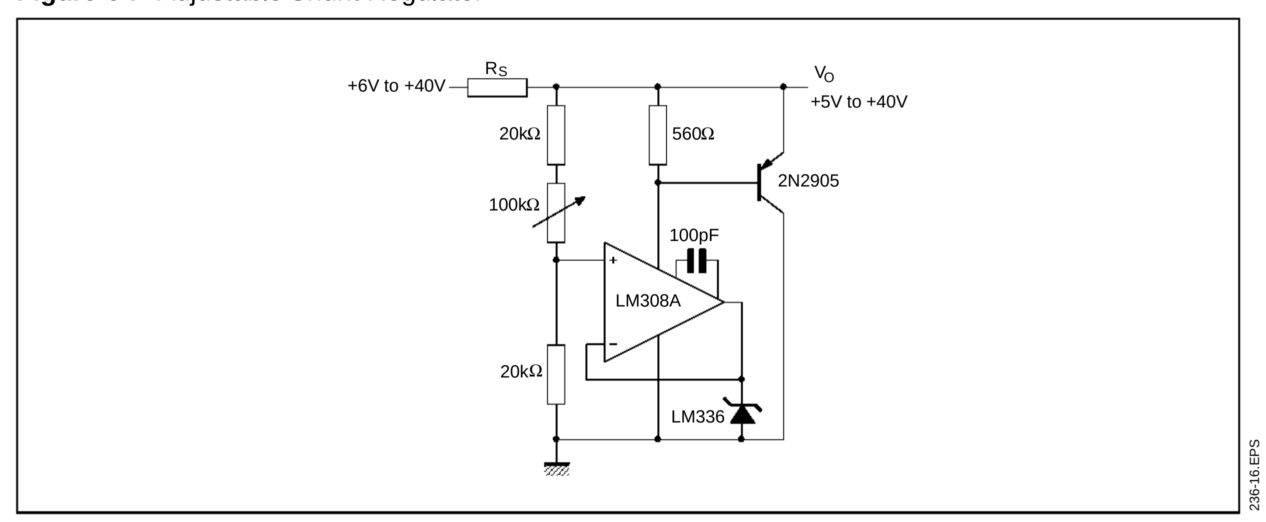


Figure 7 : Linear Ohmmeter

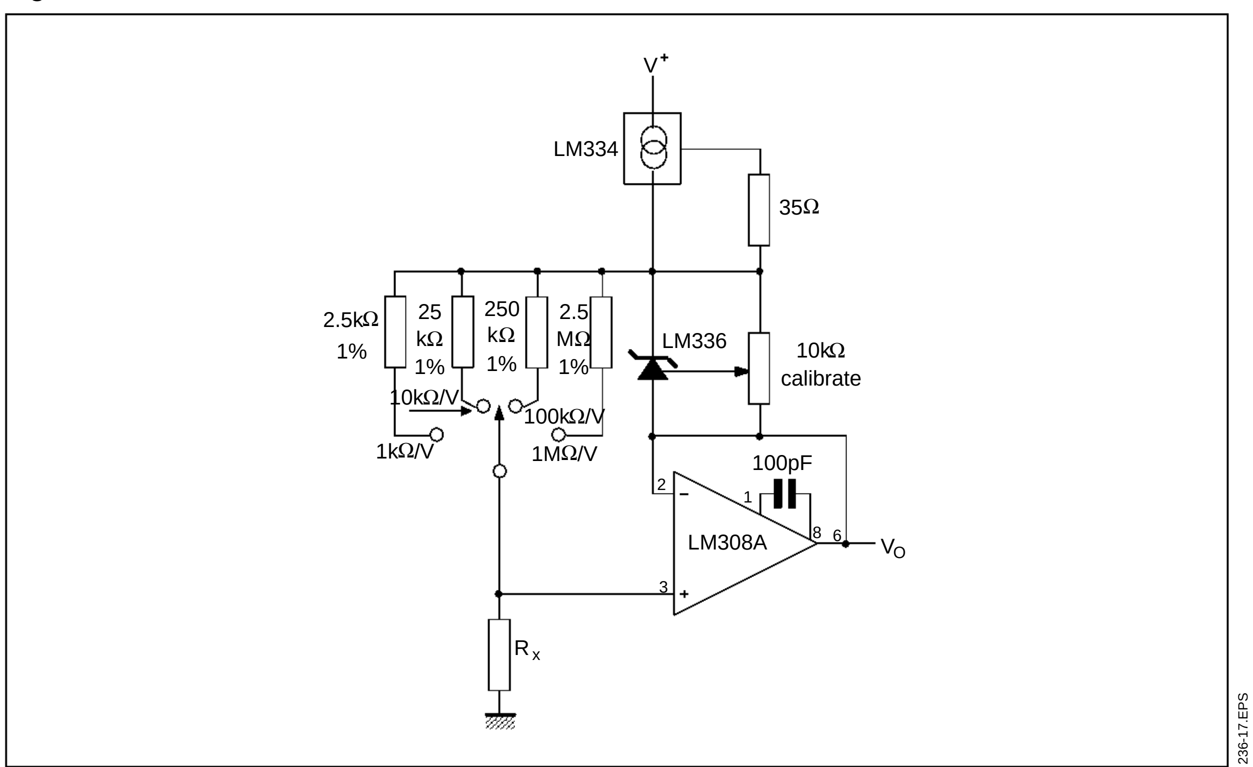


Figure 8 : Bipolar Output Reference

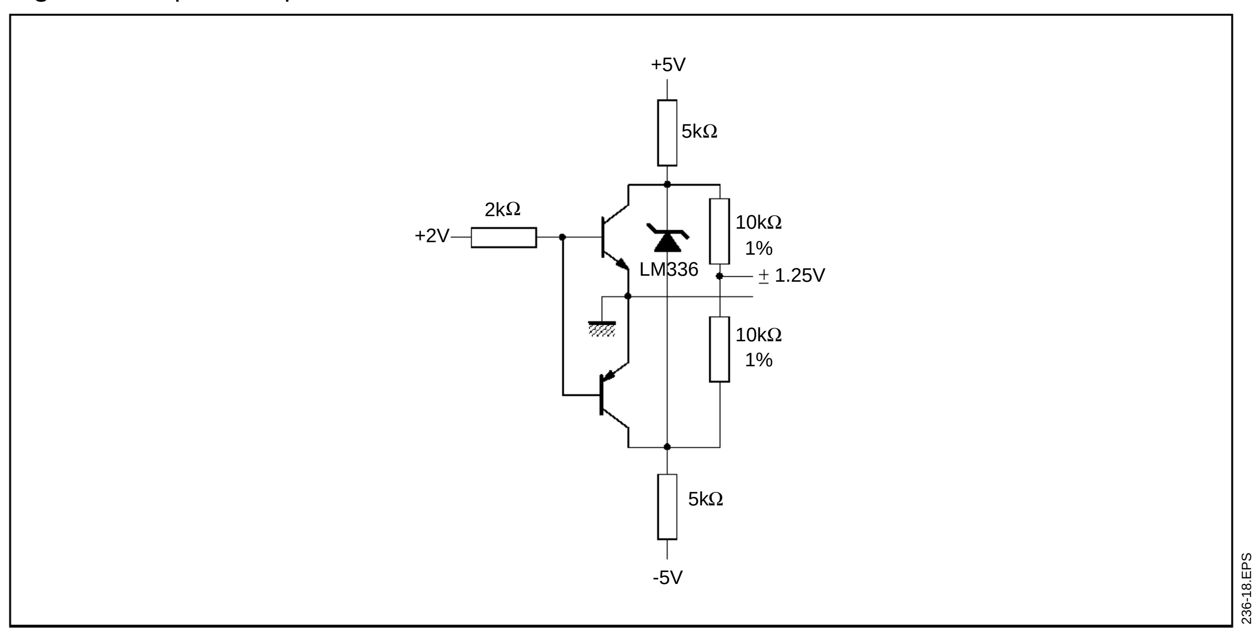


Figure 9 : 5V Buffered Reference

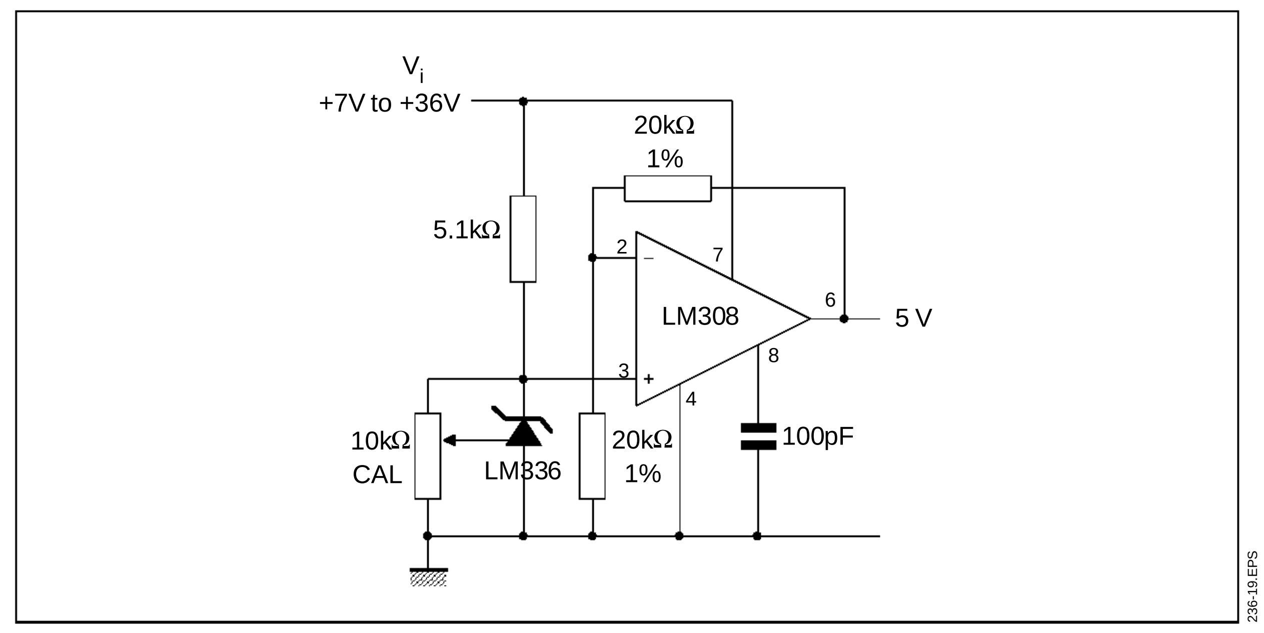
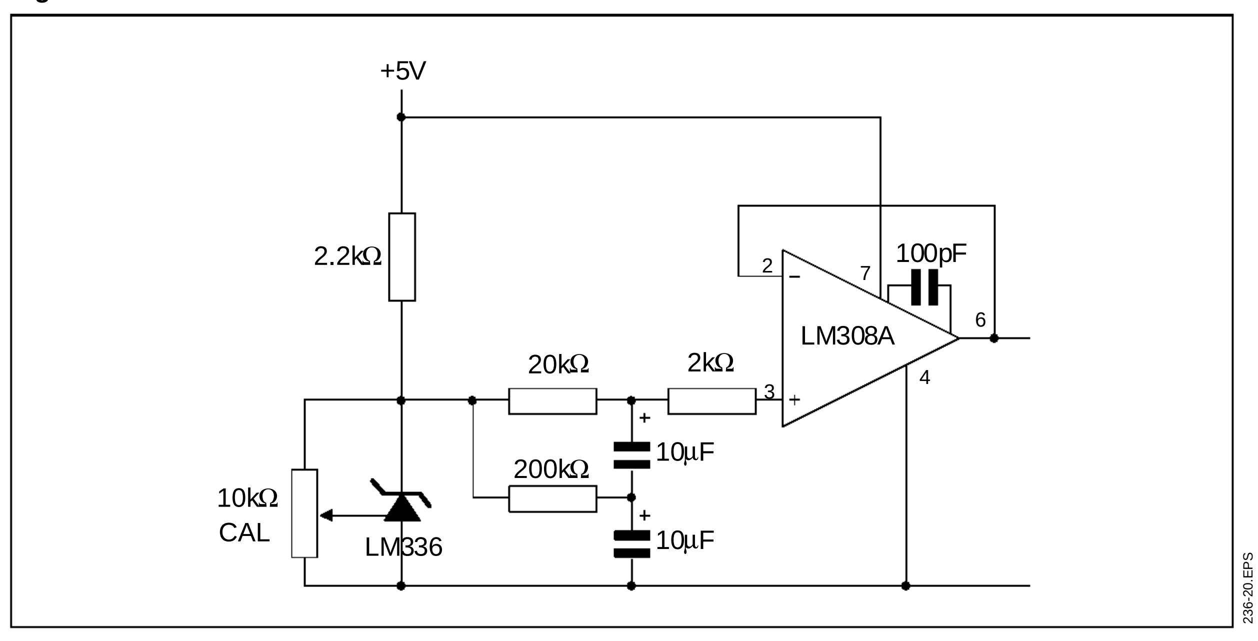
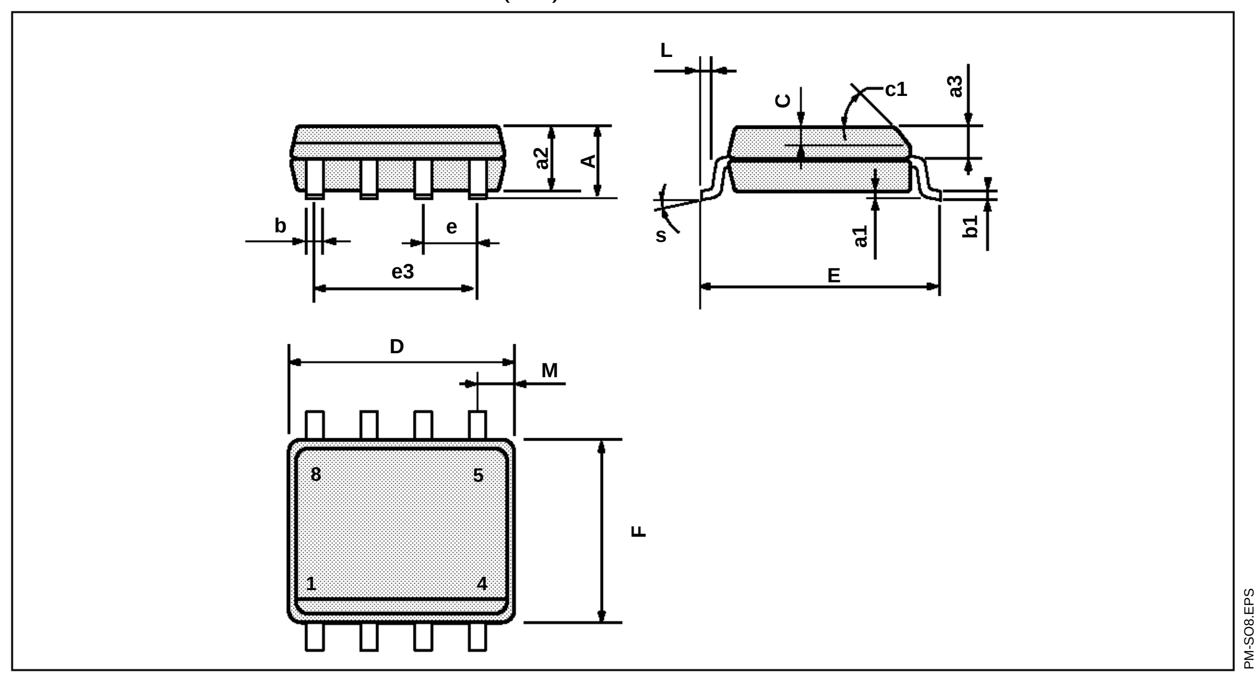


Figure 10 : Low Noise Buffered Reference



PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)

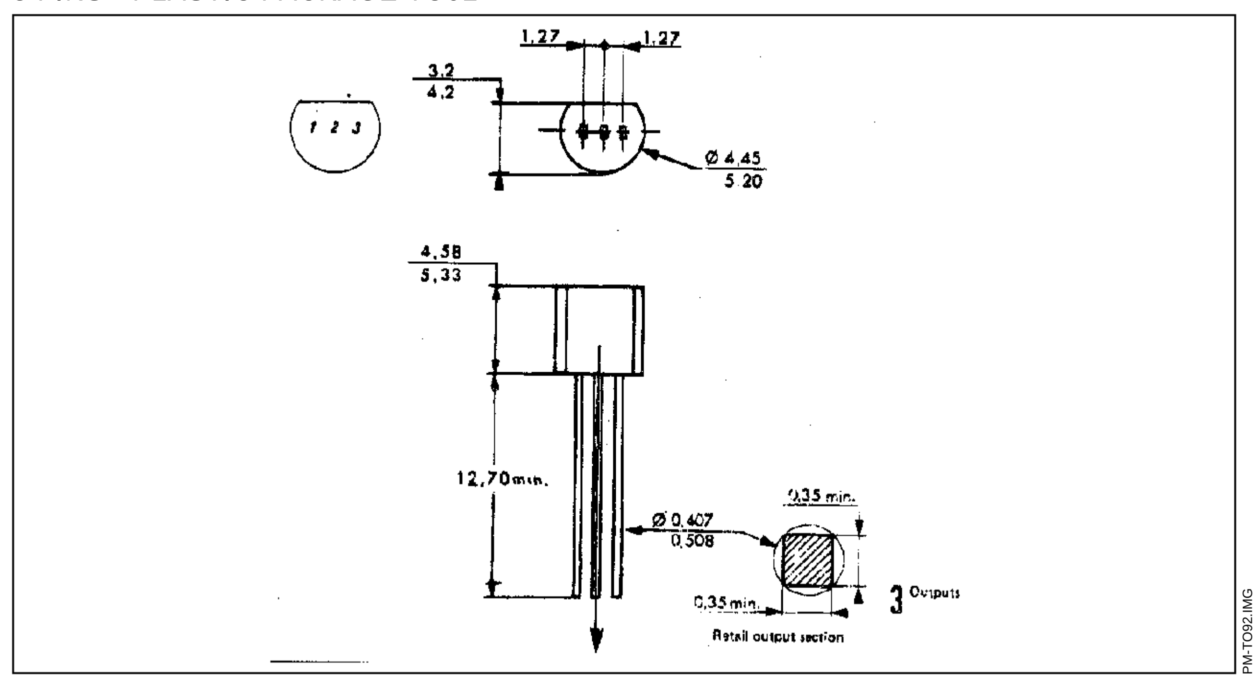


Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

SO8.TBL

PACKAGE MECHANICAL DATA

3 PINS - PLASTIC PACKAGE TO92



PM-TO92.IMG

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
L		1.27			0.05	
B	3.2	3.7	4.2	0.126	0.1457	0.1654
O1	4.45	5.00	5.2	0.1752	0.1969	0.2047
C	4.58	5.03	5.33	0.1803	0.198	0.2098
K	12.7			0.5		
O2	0.407	0.5	0.508	0.016	0.0197	0.02
a	0.35			0.0138		

TO92.TBL